

What is Claimed is:

- Sum B1
1. An isolated polynucleotide comprising a nucleotide sequence selected from the group consisting of:
 - (a) a first nucleotide sequence which is a polymorphic variant of a reference sequence for the β_2 -adrenergic receptor (β_2 AR) gene or a fragment thereof, wherein the reference sequence comprises SEQ ID NO:1 and the polymorphic variant comprises at least one polymorphism selected from the group consisting of adenine at PS2 and thymine at PS5; and
 - (b) a second nucleotide sequence which is complementary to the first nucleotide sequence.
 2. The isolated polynucleotide of claim 1 which comprises a β_2 AR isogene.
 3. The isolated polynucleotide of claim 1 which is a DNA molecule and comprises both the first and second nucleotide sequences and further comprises expression regulatory elements operably linked to the first nucleotide sequence.
 4. A recombinant organism transformed or transfected with the isolated polynucleotide of claim 3.
 5. The recombinant organism of claim 4 which is a genetically-modified animal.
 6. The isolated polynucleotide of claim 1, wherein the first nucleotide sequence is a polymorphic variant of a fragment of the β_2 AR gene, the fragment comprising one or more polymorphisms selected from the group consisting of adenine at PS2 and thymine at PS5.
 7. A composition comprising at least one genotyping oligonucleotide for detecting a polymorphism in the β_2 -adrenergic receptor (β_2 AR) gene at a polymorphic site selected from the group consisting of PS2 and PS5.
 8. The composition of claim 7, wherein the genotyping oligonucleotide is an allele-specific oligonucleotide that specifically hybridizes to an allele of the β_2 AR gene at a region containing the polymorphic site.
 9. A diagnostic kit for predicting an individual's response to a β -agonist comprising a set of genotyping oligonucleotides, wherein said set comprises oligonucleotides for genotyping PS3, PS9 and PS11 in the β_2 AR gene packaged in a container.
 10. The kit of claim 9, wherein the set of genotyping oligonucleotides consists of a first primer extension oligonucleotide for genotyping PS3, a second primer extension oligonucleotide for genotyping PS9, and a third primer extension oligonucleotide for genotyping PS11.
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11. The kit of claim 9, wherein the set of genotyping oligonucleotides further comprises oligonucleotides for genotyping one or more additional β_2 AR polymorphic sites selected from the group consisting of PS1, PS2, PS4, PS5, PS6, PS7, PS8, PS10, PS12 and PS13.
12. The kit of claim 9, wherein the β -agonist is albuterol.
13. A method for genotyping the β_2 -adrenergic receptor (β_2 AR) gene of an individual, which comprises determining for the two copies of the β_2 AR gene present in the individual the identity of the nucleotide pair at one or both of PS2 and PS5.
14. The method of claim 13, further comprising determining for the two copies of the β_2 AR gene present in the individual the identity of the nucleotide pair at one or more additional polymorphic sites in the β_2 AR gene.
15. The method of claim 14, wherein the additional polymorphic sites are selected from the group consisting of PS1, PS3, PS4, PS6, PS7, PS8, PS9, PS10, PS11, PS12 and PS13.
16. A method for haplotyping the β_2 -adrenergic receptor (β_2 AR) gene in an individual which comprises determining for one copy of the β_2 AR gene present in the individual, the identity of the nucleotide at one or both of PS2 and PS5.
17. The method of claim 16, further comprising determining for the one copy of the β_2 AR gene the identity of the nucleotide at one or more additional polymorphic sites in the β_2 AR gene.
18. The method of claim 17, wherein the additional polymorphic sites are selected from the group consisting of PS1, PS3, PS4, PS6, PS7, PS8, PS9, PS10, PS11, PS12 and PS13.
19. A method for predicting a Caucasian individual's genotype for one or both of PS9 and PS10 in the individual's β_2 AR gene, which comprises
- (a) determining a first genotype for one or more of PS1, PS3, PS4 and PS6 in the individual's β_2 AR gene, and
 - (b) using the first genotype to assign a second genotype for a second polymorphic site in the individual's β_2 AR gene,
- wherein if the first polymorphic site is PS1, PS4 or PS6, then the second polymorphic site is PS10, and if the first polymorphic site is PS3, then the second polymorphic site is PS9.
20. The method of claim 19, wherein the first genotype is for PS3 and one or more of PS1, PS4 and PS6 and the second genotype is for both PS9 and PS10.

21. A method for predicting an individual's bronchodilating response to a β -agonist, which comprises
- (a) assigning a β_2 AR haplotype pair to the individual, and
 - (b) using the assigned haplotype pair to make a response prediction,
- wherein assignment of β_2 AR haplotype pair 4/6 or 2/2 predicts a good bronchodilating response; assignment of β_2 AR haplotype pair 2/6 predicts an intermediate bronchodilating response and assignment of β_2 AR haplotype pair 2/4 or 4/4 predicts no bronchodilating response.
22. The method of claim 21, wherein the assigning step comprises determining a genotype for PS3, PS9 and PS11 in the individual's β_2 AR gene and using the genotype to assign the haplotype pair.
23. The method of claim 22, wherein the assigning step further comprises determining a genotype for one or more additional polymorphic sites selected from the group consisting of PS1, PS2, PS4, PS5, PS6, PS7, PS8, PS10, PS12 and PS13.
24. The method of claim 21, wherein the β -agonist is albuterol.
25. A method for identifying an association between a haplotype of the β_2 -adrenergic receptor (β_2 AR) gene and a trait, which comprises comparing the frequency of the haplotype in a population exhibiting the trait with the frequency of the haplotype in a reference population, wherein a higher frequency of the haplotype in the trait population than in the reference population indicates the haplotype is associated with the trait and wherein the haplotype is selected from the group consisting of haplotype numbers 1-12.
26. The method of claim 25, wherein the trait is susceptibility to a disease or condition selected from the group consisting of congestive heart failure, ischemic heart disease arrhythmia, hypertension, migraine, asthma, chronic obstructive pulmonary disease (COPD), anaphylaxis, obesity, diabetes, myasthenia gravis and premature labor.
27. The method of claim 25, wherein the trait is response to an agonist or antagonist of β_2 AR.

28. A computer system for storing and analyzing polymorphism data for the β_2 AR gene, comprising:
- (a) a central processing unit (CPU);
 - (b) a communication interface;
 - (c) a display device;
 - (d) an input device; and
 - (e) a database containing the polymorphism data;
- wherein the polymorphism data comprises the genotypes and haplotype pairs shown in Table 4 and the haplotypes shown in Table 5.
29. A genome anthology for the β_2 -Adrenergic Receptor gene (β_2 -AR) gene which comprises β_2 AR isogenes defined by haplotypes 1-12 shown in Table 5.

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